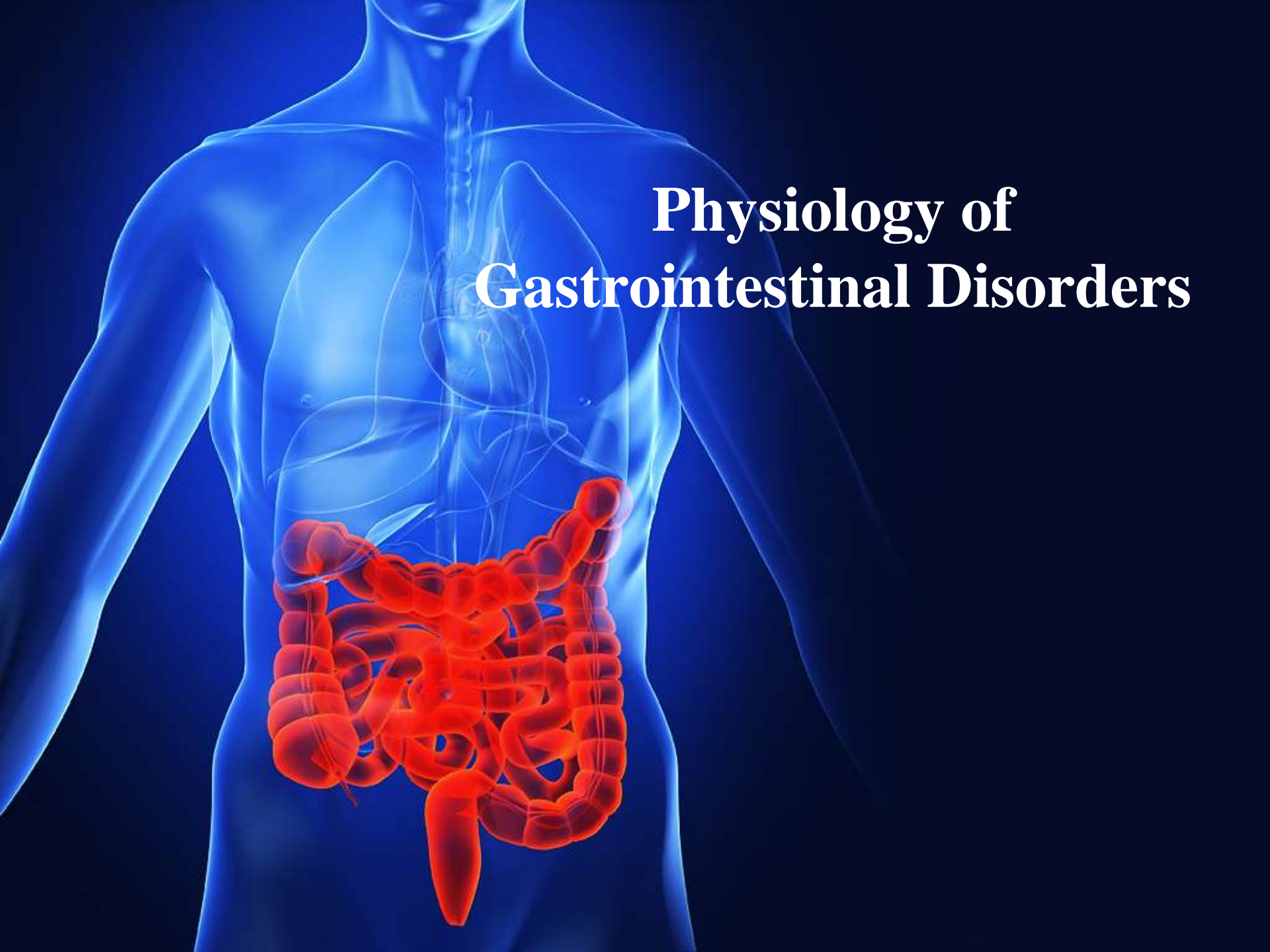


Physiology of Gastrointestinal Disorders





Disorders of Swallowing and of the Esophagus

Paralysis of the Swallowing that prevent normal swallowing

can be caused by:

- **Damage** to the fifth, ninth, or tenth **cerebral nerve**
- **Muscle dystrophy** & failure of **neuromuscular** transmission
- A few diseases such as *poliomyelitis*

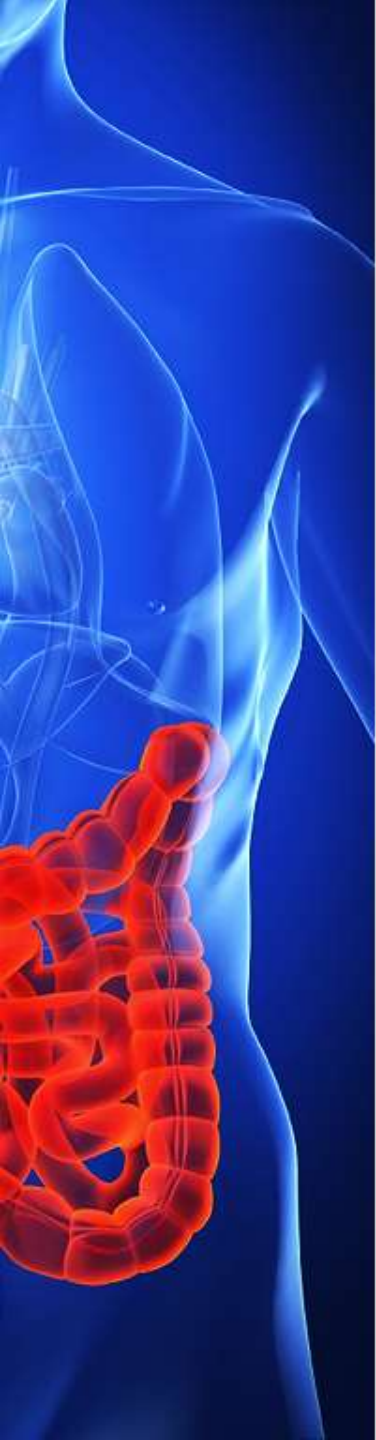
Achalasia:

Achalasia is a condition in which the **lower esophageal sphincter** fails to relax during swallowing.

As a result, food swallowed into the esophagus then fails to pass from the **esophagus** into the **stomach**.

Achalasia

- In **severe** cases, the esophagus cannot empty the swallowed food into the stomach for many **hours**, instead of the **few** seconds that is the **normal** time.
- Over months and years, the esophagus becomes **enlarged** until it often can hold as much as **1 liter** of food.
- It may become **infected** and the infection may cause **ulceration** of the esophageal mucosa.
- Eventually may lead to **death**.





Disorders of the Stomach

- **Gastritis—Inflammation of the Gastric Mucosa:**

Gastritis can be caused by:

1. Chronic bacterial infection of the gastric mucosa. This often can be treated by **antibacterial** therapy.
 2. Excesses of alcohol or aspirin.
- **Chronic Gastritis Can Lead to Gastric Atrophy and Loss of Stomach Secretions**
 - **Loss** of the stomach secretions in gastric atrophy leads to **achlorhydria** and to **pernicious anemia**.



Achlorhydria (and Hypochlorhydria)

Achlorhydria: it means that the stomach fails to secrete **hydrochloric acid**.

- pH of the gastric secretions fails to decrease below 6.5 after maximal stimulation.

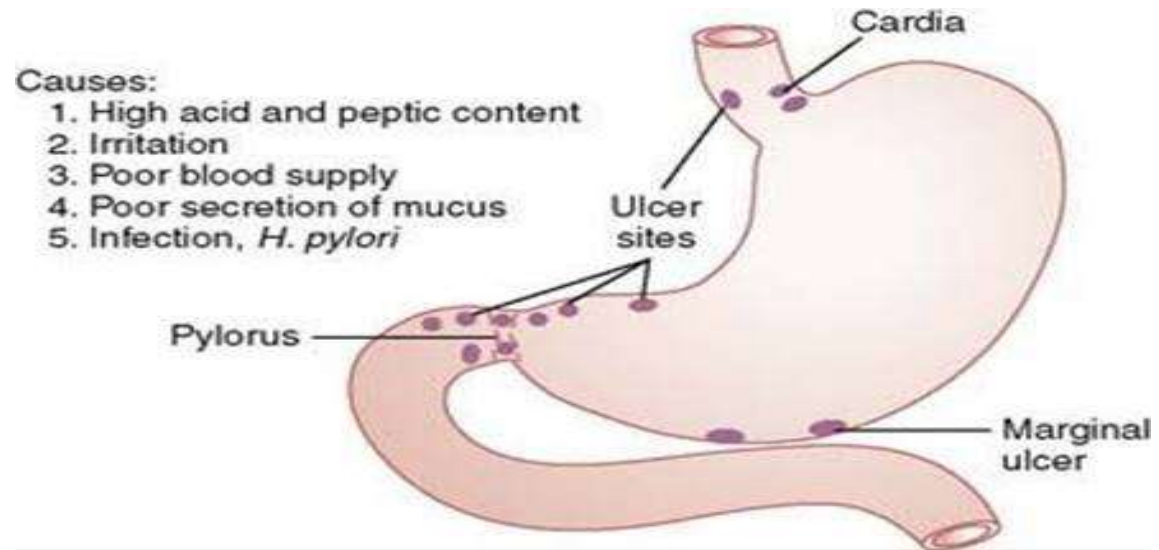
Hypochlorhydria: it means diminished acid secretion.

- When acid is not secreted, **pepsin** also usually is **not secreted**.
- The lack of acid prevents pepsin from functioning because **pepsin requires an acid for activity**.
- **Pernicious anemia:**

Normal gastric secretions contain a **glycoprotein** called **intrinsic factor** and in its absence, an adequate amount of **vitamin B₁₂** is **not made** available from the foods to cause newly forming red blood cells to mature in the bone marrow.

- Peptic Ulcer

A peptic ulcer is an excoriated area of stomach or intestinal mucosa caused by the digestive action of gastric juice or upper small intestinal secretions.

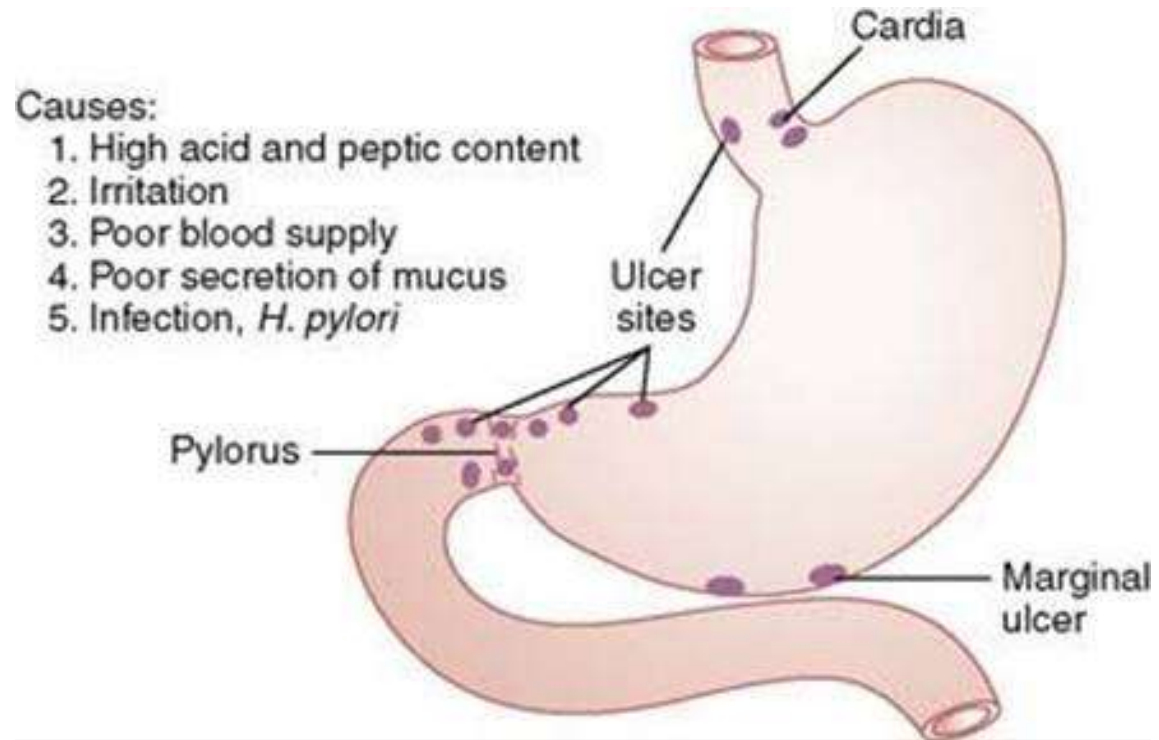


Other factors that may cause ulcers include:

- ❖ Smoking
- ❖ Alcohol
- ❖ Aspirin and other nonsteroidal anti-inflammatory drugs
- ❖ Excess secretion of gastric juices

Treatment of Peptic Ulcers

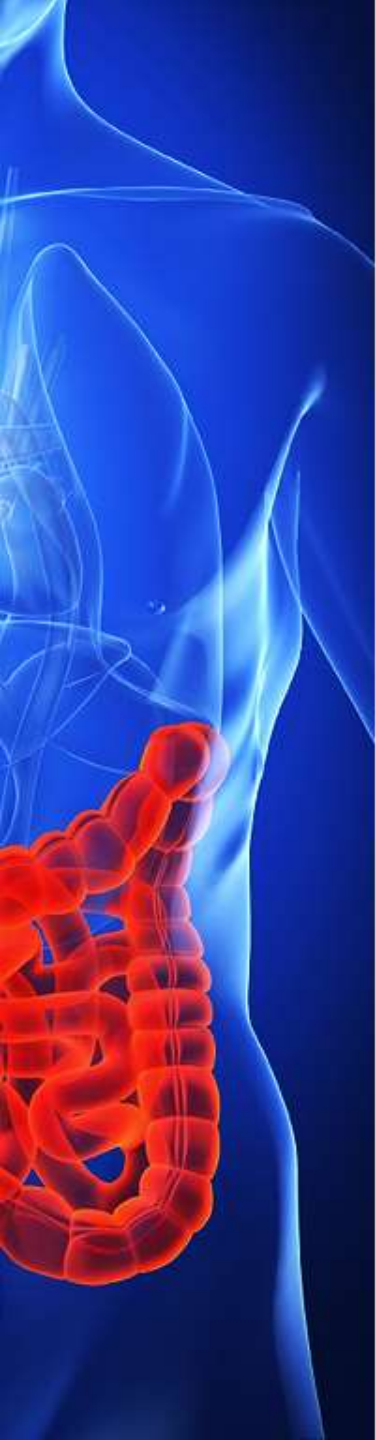
- Use of *antibiotics* along with other agents to kill infectious bacteria
- Administration of an acid-suppressant drug



Disorders of the Small Intestine

Abnormal Digestion of Food in the Small Intestine—Pancreatic Failure

- A serious cause of abnormal digestion is **failure of the pancreas** to secrete **pancreatic juice** into the small intestine.
- **Loss** of pancreatic juice **means loss** of trypsin, chymotrypsin, carboxypolypeptidase, pancreatic amylase, pancreatic lipase, and still a few other digestive enzymes.
- **Without these enzymes**, most of the **fat** entering the small intestine may be **unabsorbed**, as well as some of the proteins and carbohydrates.
- As a result, large portions of the ingested food cannot be used for nutrition and much fatty feces are excreted.





➤ **Pancreatitis—Inflammation of the Pancreas**

Two Types:

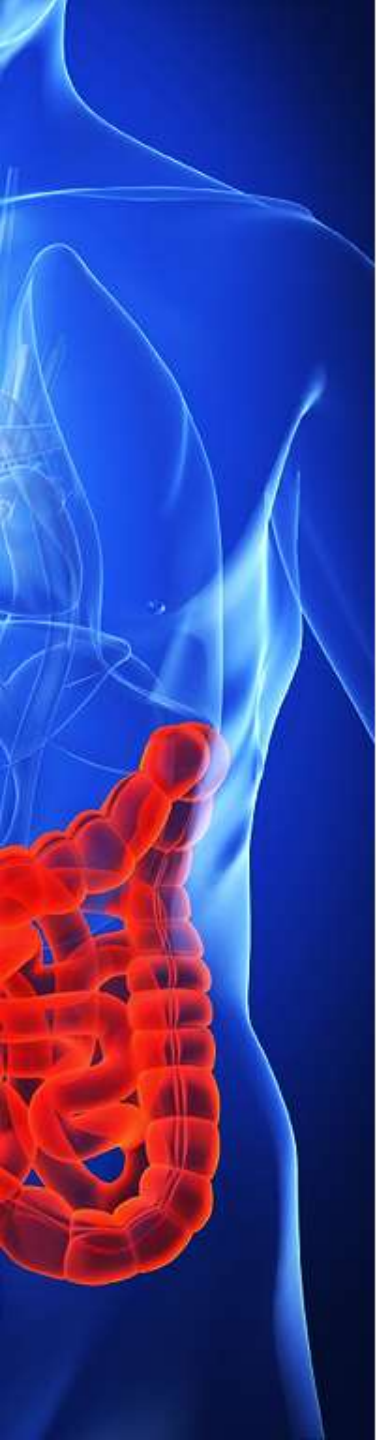
- Acute pancreatitis
- Chronic pancreatitis

The most common cause of pancreatitis is drinking excess alcohol

The second most common is caused by a **gallstone**

➤ **Malabsorption by the Small Intestinal Mucosa—Sprue**

- Nutrients are not adequately absorbed from the small intestine even though the food has become well digested.
- Several diseases can cause decreased absorption by the mucosa.
- They are classified together under the term “sprue.”
- Malabsorption also can occur when large portions of the small intestine have been removed.



➤ **Nontropical Sprue**

- *Celiac disease (in children) or gluten enteropathy:* results from the toxic effects of *gluten* present in certain **types of grains**, especially wheat and rye.
- **Gluten** has a direct destructive effect on **intestinal enterocytes**.
- **Removal** of wheat and rye flour from the diet frequently results in cure within weeks, especially in children with this disease.

➤ **Tropical Sprue**

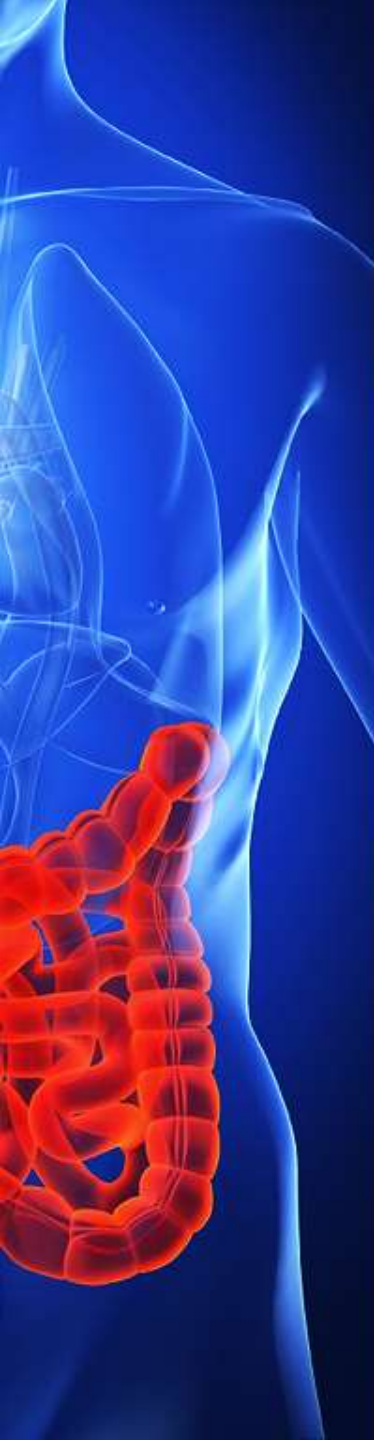
- It's frequently occurs in the **tropics** and can often be treated with **antibacterial agents**.
- It might be caused by inflammation of the intestinal mucosa resulting from **unidentified infectious agents**.

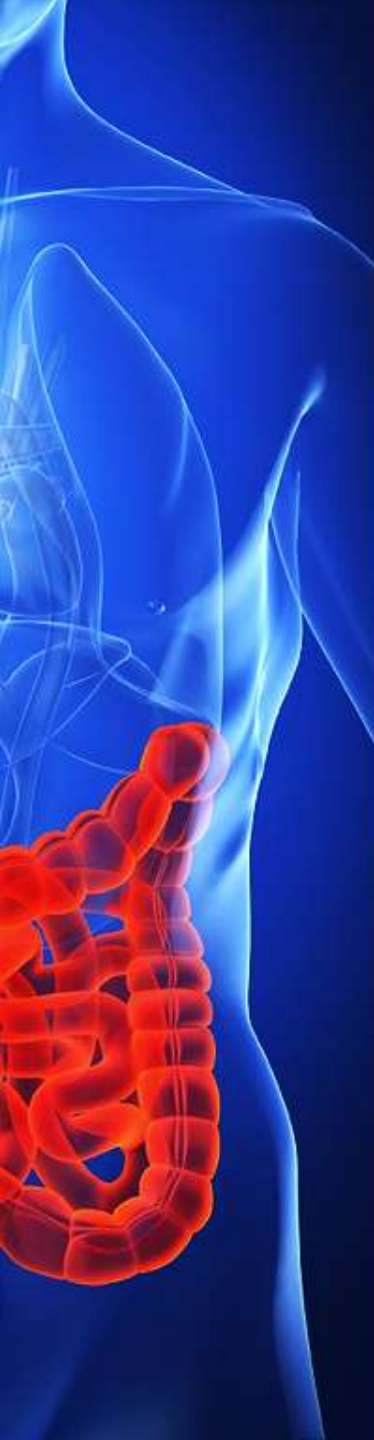


Malabsorption in Sprue

- ❖ In the early stages of sprue, intestinal **absorption of fat** is more **impaired** than absorption of other digestive products. The fat that appears in the stools is almost entirely in the form of **salts of fatty acids** rather than undigested fat. The condition is called *steatorrhea*, which means **excess fats in the stools**.
- ❖ In severe cases of sprue, in addition to malabsorption of fats there is also impaired absorption of proteins, carbohydrates, calcium, vitamin K, folic acid, and vitamin B₁₂.
- As a result, the person suffers:
 - Severe nutritional deficiency
 - Osteomalacia
 - Inadequate blood coagulation caused by lack of vitamin K
 - Pernicious anemia to diminished vitamin B12 and folic acid absorption.

Disorders of the Large Intestine

- 
- **Constipation:** it means slow movement of feces through the large intestine; it is often associated with large quantities of dry & hard feces in the colon that accumulate because of overabsorption of fluid.
 - It might be occurred because of tumors, ulcers, & spasm of a small segment of the sigmoid colon.
 - If one does not allow defecation to occur when the defecation reflexes are excited, the reflexes become **less strong** over months or years, and the **colon becomes atonic**



➤ **Megacolon**

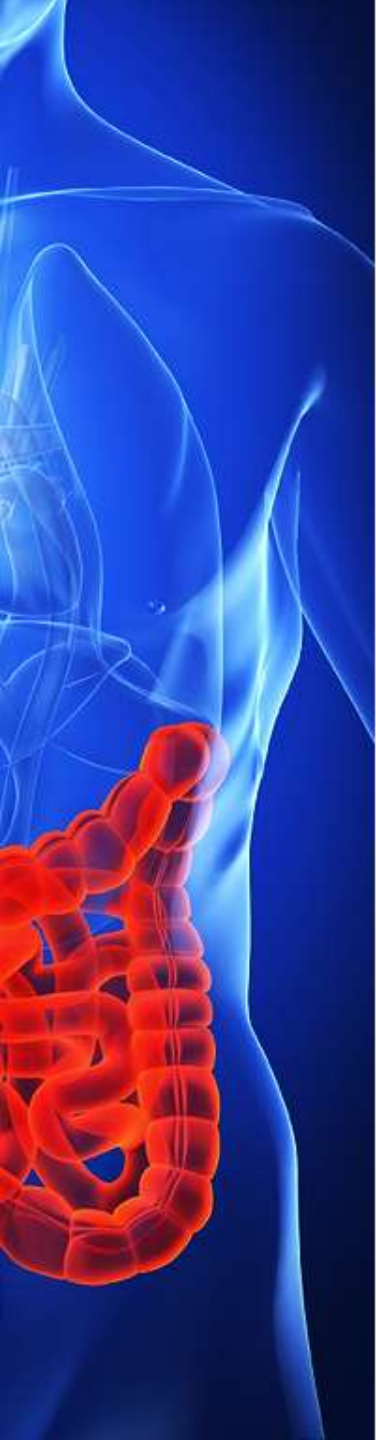
- The constipation is so severe that bowel movements occur only once every several days or sometimes only once a week, and large quantities of fecal matter accumulate in the colon causing the colon sometimes to distend.
 - A frequent cause of megacolon is lack of or deficiency of ganglion cells in the sigmoid colon.
- **Diarrhea:** it results from **rapid movement of fecal matter** through the large intestine.

Causes of diarrhea:

- ❖ **Enteritis:** it means inflammation usually caused either by a **virus** or by **bacteria** in the intestinal tract.
- ❖ **Psychogenic Diarrhea** (such as during examination time): It is called **psychogenicemotional diarrhea**. It is caused by excessive stimulation of the **parasympathetic nervous system**.

Ulcerative Colitis

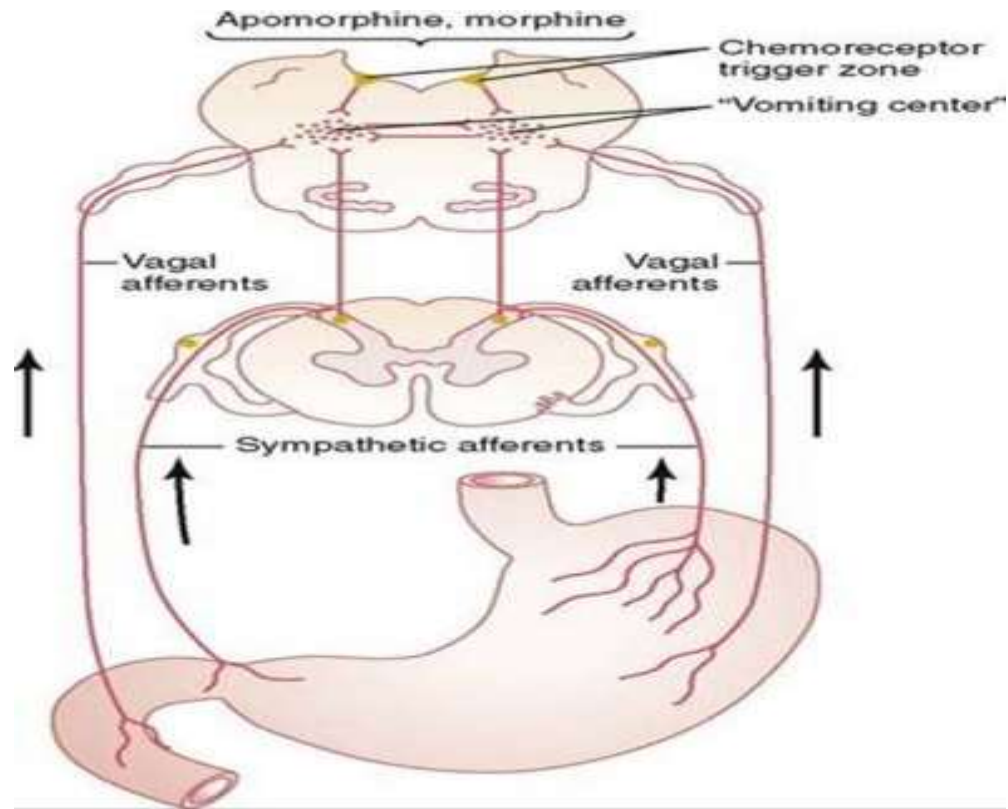
- Ulcerative colitis is a disease in which extensive areas of the walls of the large intestine become **inflamed** and **ulcerated**.
- Mass movements occur **much of the day** rather than for the usual 10 to 30 minutes.
- Also, the colon's secretions are greatly enhanced. As a result, the patient has **repeated diarrheal bowel movements**.
- The cause of ulcerative colitis is unknown. It is believed that it results from an **allergic or immune destructive effect**, it also could result from **chronic bacterial infection** or **inherited**.



General Disorders of the Gastrointestinal Tract

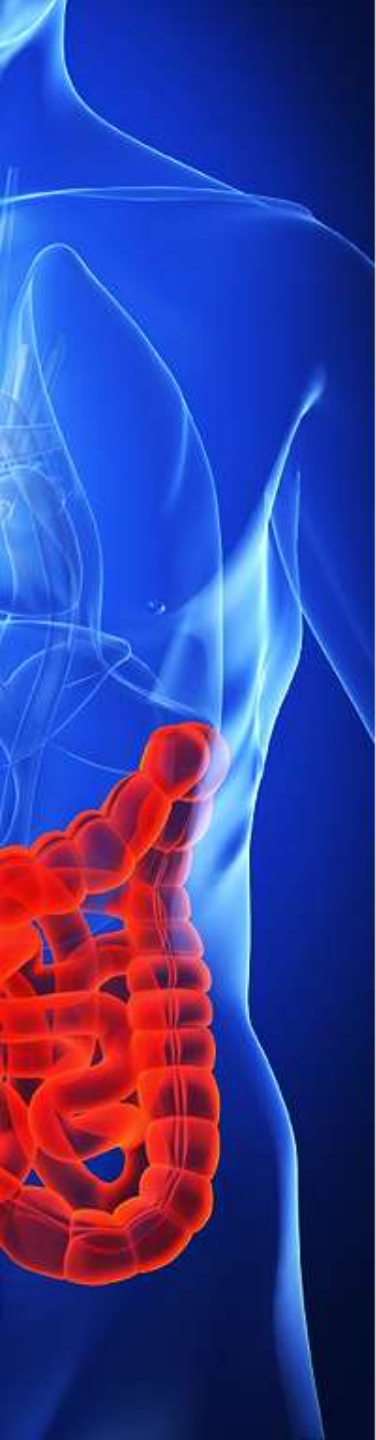
Vomiting:

- The upper gastrointestinal tract rids of its contents when almost any part of the upper tract becomes irritated, overdistended, or even overexcitable.
- Excessive distention or irritation of the duodenum provides a strong stimulus for vomiting.



Nausea

- It gives often an indication of vomiting.
- It can be caused by:
 - ❖ Irritative impulses coming from the gastrointestinal tract
 - ❖ Impulses that originate in the lower brain associated with motion sickness
 - ❖ Impulses from the cerebral cortex to initiate vomiting.



Gastrointestinal Obstruction

- Some common causes of obstruction are: cancer, fibrotic constriction resulting from ulceration or from adhesions, spasm of a segment of the gut, and paralysis of a segment of the gut.
- The abnormal consequences of obstruction depend on the point in the gastrointestinal tract that becomes obstructed.

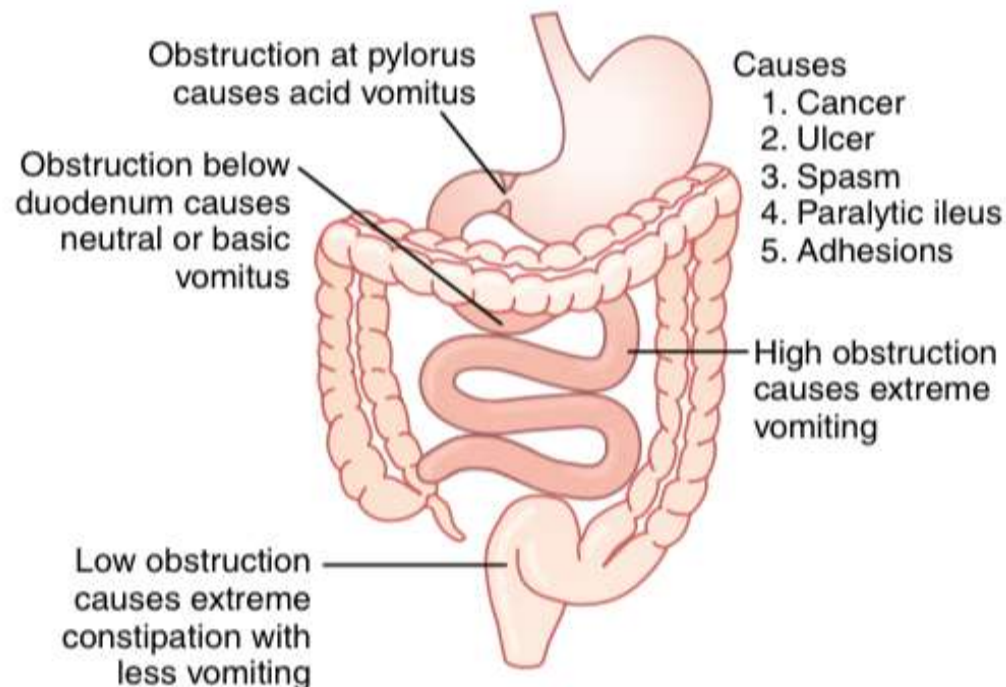
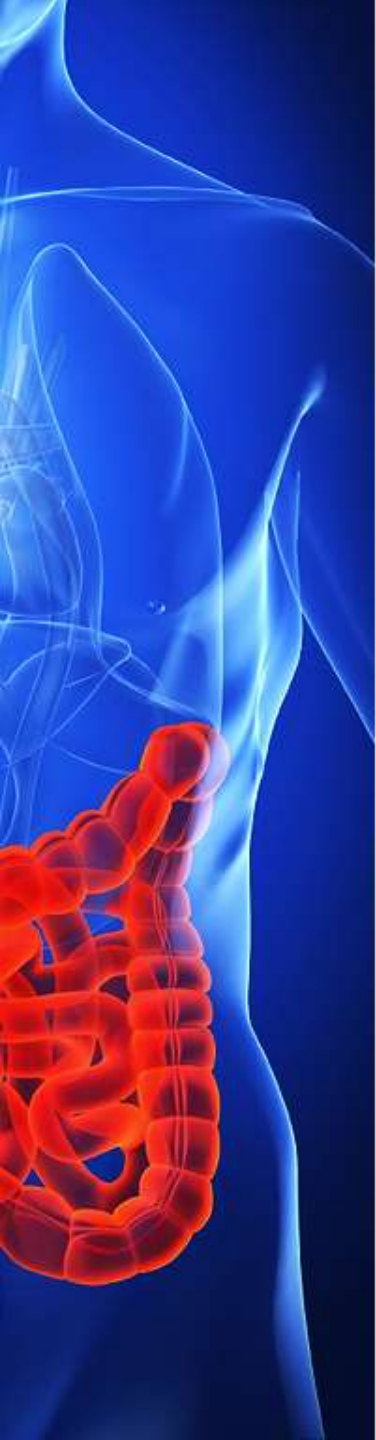


Figure 66-3 Obstruction in different parts of the gastrointestinal tract.

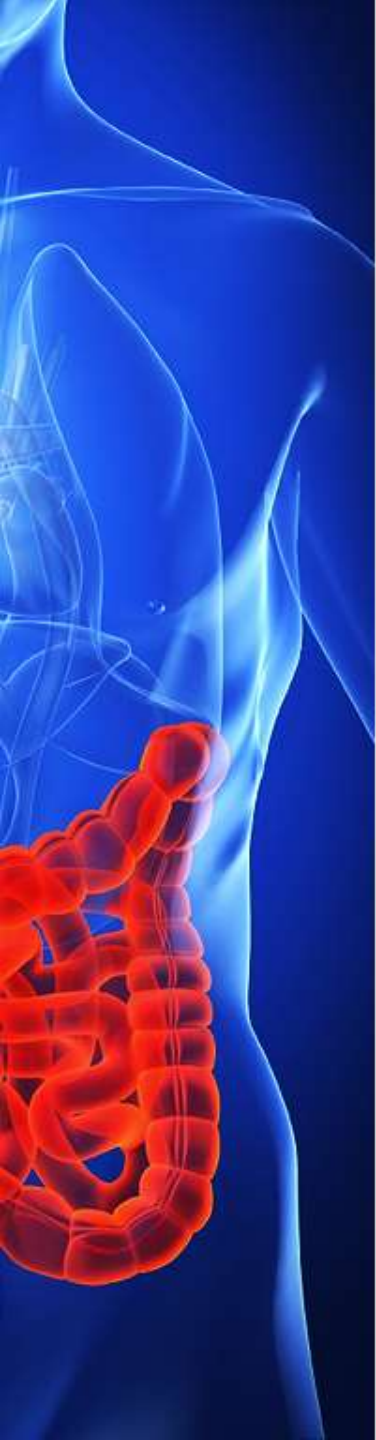
Gases in the Gastrointestinal Tract; “Flatus”

- Gases, called flatus, can enter the gastrointestinal tract from three sources:
 1. Swallowed air.
 2. Gases formed in the gut as a result of bacterial action.
 3. Gases that diffuse from the blood into the gastrointestinal tract.
- Most gases in the **stomach** are mixtures of **nitrogen and oxygen** derived from swallowed air. In the typical person these gases are expelled by **belching**.
- Only **small amounts** of gas normally occur in the **small intestine**.
- In the large intestine, most of the gases are derived from **bacterial action**, including carbon dioxide, methane, and hydrogen.
- Certain foods are known to cause **greater expulsion of flatus** through the anus than others such as beans, cabbage, onion, cauliflower, corn, and certain irritant foods such as vinegar.
- **Unabsorbed fermentable types of carbohydrates** serve as a suitable medium for **gas-forming bacteria** such as beans.



References

- Hall, J. E. 1. (2011). *Guyton and Hall textbook of medical physiology* (12th edition.). Philadelphia, PA: Elsevier.



Any Questions?

Thank you!!!

